

Spring-2018 Phys101  
Assignment 13

**Check MateringPhysics for other problems**

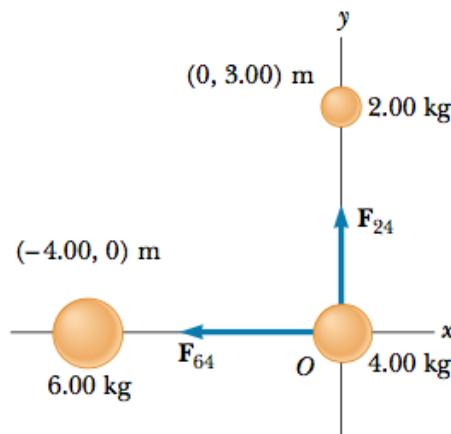
Due date: 17 May 2018.

**Discussion questions**

- 1- Since a satellite is constantly attracted toward the earth by the gravitational interaction, why doesn't it crash into the earth?
- 2- If a projectile is fired straight up from the earth's surface, what would happen if the total mechanical energy (kinetic plus potential) is (a) less than zero, and (b) greater than zero? In each case, ignore air resistance and the gravitational effects of the sun, the moon, and the other planets.
- 3- Is the potential energy associated with the Earth–Moon system greater than, less than, or equal to the kinetic energy of the Moon relative to the Earth?

**Problems**

- 4- The free-fall acceleration on the surface of the Moon is about one-sixth that on the surface of the Earth. If the radius of the Moon is about  $0.250R_E$ , find the ratio of their average densities,  $\rho_{\text{Moon}} / \rho_{\text{Earth}}$ .
- 5- Three uniform spheres of masses 2.00 kg, 4.00 kg, and 6.00 kg are placed at the corners of a right triangle, as illustrated below. Calculate the resultant gravitational force on the 4.00-kg mass, assuming that the spheres are isolated from the rest of the Universe.



- 6- Two satellites are in circular orbits around a planet that has radius  $9.00 \times 10^6$  m. One satellite has mass 68.0 kg, orbital radius  $5.00 \times 10^7$  m, and orbital speed 4800 m/s. The second satellite has mass 84.0 kg and orbital radius  $3.00 \times 10^7$  m. What is the orbital speed of this second satellite?
- 7- A 5000-kg spacecraft is in a circular orbit 2000 km above the surface of Mars. How much work must the spacecraft engines perform to move the spacecraft to a circular orbit that is 4000 km above the surface?